

during an interview in another application involving the same Applicant and the same Examiner, Applicant has filed a number of applications that are closely related. To avoid an argument by an infringer that the patent resulting from this application is invalid because prior art from related applications was not brought to the attention of the Examiner in this case, it was Applicant's intention to try to make all references cited in each of the related case of record in the other cases. If the Examiner feels inundated, Applicant can at least assure the Examiner that there is no effort to obscure any reference. The Examiner must appreciate that under the Duty of Candor, and the likelihood of an infringer raising a defense of invalidity based on an alleged breach of that duty, it is wise for Applicant to cite all of the prior art from related cases. Applicant has complied with the duty, and the rules for proper submission of references. It is expected that the Examiner will follow Patent and Trademark Office procedure and review the references and make them of record. Applicant's attorney is not aware of any policy that allows an Examiner to simply not review and make of record correctly cited references because of their large number. However, in view of the Examiner's expressed position on this matter, all references from related applications are no longer being routinely cited. Further, when this issue came up during the telephone calls relating to the restriction requirement, Applicant's attorney orally advised the Examiner that the following U. S. patents were considered to be the most pertinent by Applicant: 5,594,268; 5,672,927; 6,075,304 and 5,986,365.

Claim 21 was rejected in the outstanding Office Action under 35 U.S.C. §112, second paragraph. Even though this rejection is respectfully traversed, and it is Applicant's position that the terms originally used and now used are mathematically the same, the claim and the specification have been amended in a non-limiting fashion to comply with the Examiner's suggestion.

The allowance of claims 30-37 and 57, and the allowability of claims 21, 28 and 29, is noted with appreciation. Even though the Office Action Summary indicated that claims 8, 11-12 and 23 were rejected, there was no specific basis for a rejection made to those claims. Also, claim 58 was not addressed in the Office Action. Thus it is believed that those claims would also be allowable.

Claims 1, 2, 4, 5, 7, 10, 19, 52 and 54-56 were rejected in the outstanding Office Action under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,241,229

(Katakura). This rejection is respectfully traversed. Katakura discloses a magnetic disc drive motor. The disc drive includes a cylindrical holder 12 projecting upward from the central area of a motor frame 11. A stator core 18 is rigidly fitted to the outer periphery of the holder 12. The space between the stator core 18 and the motor frame 11 is filled with a very hard epoxy resin material 22 injected into the base portion of the holder 12.

The present invention covers several different embodiments that address the problems with prior art devices, including the problem of reducing vibrations from the motor being transmitted to the discs being rotated by the motor, in different ways. In the embodiment of Fig. 2, a thermoplastic material is used to help stiffen the entire assembly, which results in a change in the harmonic frequency to a frequency that does not have as deleterious of an effect. In the embodiments of Figs. 4 and 14, there is no metal-to-metal contact between the stator core and the baseplate. Thus the vibrations from the stator can only pass to the baseplate, and thus to the shaft and hub, through the thermoplastic material that joins the stator to the baseplate.

Claim 1 requires a stator assembly with a core having poles and windings around the poles, with an injection molded thermoplastic material substantially encapsulating the windings. The resin used in Katakura is not a thermoplastic material. Epoxy resins are thermosetting, not thermoplastic. Further, claim 1 has been amended to require that the thermoplastic material has a modulus of elasticity of at least 1,000,000 psi at 25°C. It is believed that the epoxy used in Katakura would not have this high of a modulus of elasticity. Therefore claim 1, and claims 4, 5, 7, 52 and 54-55 dependent thereon, are not anticipated by Katakura. Further, claim 4 requires that the stator assembly is rigidly attached to the baseplate by being rigidly attached to a support member secured to the baseplate. In Katakura the holder 12 is an integral part of the baseplate rather than a separate support member secured to the baseplate. Claim 55 is directed to a hard drive and requires the baseplate of the motor to also constitute the baseplate of the hard drive housing. There is no disclosure of this concept in Katakura. Claims 4 and 55 thus further differentiate over Katakura.

Claim 10 requires the stator assembly to be spaced from the baseplate and not be in direct contact with each other, and that a thermoplastic material be secured to the baseplate and substantially encapsulates the stator windings, the thermoplastic material joining the stator assembly to the baseplate and filling in the space between the stator

assembly and the baseplate. As noted above, the epoxy material of Katakura is not a thermoplastic material. The Office Action takes the position that in Katakura the stator assembly is spaced from the baseplate. This is not correct. As noted above, the holder 12 is a part of the baseplate. Thus in Katakura the stator assembly is in direct contact with the baseplate. In this area of contact, the epoxy resin does not fill in because there is no space between the stator assembly and the baseplate. New claim 63, patterned after original claim 10, states this same concept slightly differently, requiring that the stator assembly is connected to the baseplate only through the thermoplastic material. Claim 10, claims 19 and 56 dependent thereon, and new claim 63, are thus not anticipated by Katakura.

In the outstanding Office Action claims 1-5, 7, 10, 13-19 and 49-56 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,694,268 (Dunfield). This rejection is overcome by the foregoing amendment. While Dunfield discloses a motor having an overmolded stator, Dunfield teaches away from the present invention. Claim 1 requires the stator core to be rigidly attached to the baseplate, and for the thermoplastic material substantially encapsulating the windings to contact the baseplate such that the core, baseplate and windings are rigidly fixed together. Dunfield teaches to isolate the stator from the base of the motor (which may serve as the base for a data storage device). See col. 1, lines 11-14; col. 5, lines 26-29; col. 9, lines 11-14 and col. 11, lines 60-61. None of the embodiments disclosed in Dunfield discloses a rigid contact between the stator core and the baseplate. The Office Action states that core 432 is "rigidly attached to the baseplate with support member 12 or 32." Fig. 22 of Dunfield, which shows core 432, does not include reference numbers 12 or 32. In other embodiments reference number 12 refers to the base and number 32 refers to the arcuate path in Fig. 1 (col. 4, line 44) and spindle motor of Fig. 2. Thus no rigid attachment through a support member (as required by claims 4 and 5) has been shown. Further, while it is not clear from the Dunfield disclosure how the overmold 428 of Fig. 22 is secured to the base 418, it is clear from col. 11 lines 51-55 that the attachment is not a rigid one. The raised annular projection 436 is compressed against base 418 to secure the overmold to the base. This is not a rigid attachment between the stator core and the base, as the raised projection again is designed to isolate the stator, in line with the overall goal of mechanically isolating the stator from the base. Claim 1, and claims

3-5, 7, 52 and 54-55 dependent thereon, are thus not anticipated by Dunfield. As noted above, Dunfield does not show a stator assembly rigidly attached to the baseplate by being rigidly attached to a support member secured to said baseplate, as required by claims 4 and 5. Claim 7 further requires that the thermoplastic encapsulates the stator core except where the stator core is rigidly attached to the baseplate. There is no disclosure in Dunfield of a core that is not encapsulated where it is attached to the baseplate. Claim 52 requires the shaft to be rotatably supported by the baseplate and the hub to be rigidly attached to the shaft. None of the Dunfield embodiments disclose this feature. Thus claims 4-5, 7 and 52 are further patentable over Dunfield.

Claim 10 requires the thermoplastic material to join the stator assembly to the baseplate in the space between the stator assembly and the baseplate, filling in the space between them and being in intimate contact with the baseplate. Dunfield does not disclose any embodiment wherein the thermoplastic material encapsulating the winding is in intimate contact with the baseplate. Claim 10, and claims 13-19, 53 and 56 dependent thereon, are thus not anticipated by Dunfield. Claims 14-17 require various features that are not found in any of the Dunfield embodiments, such as a hub that comprises an outer member having an inside aperture and a steel ferrule fixed inside said aperture, with the magnet attached to the ferrule and bearings interposed between the shaft and the ferrule. These claims are thus further patentable over Dunfield.

Claim 49 requires a coreless stator assembly comprising windings encapsulated in a thermoplastic material; and a hub rotatably supported on said shaft, said shaft having a magnet connected thereto in operable proximity to the stator assembly, the hub also including a flux return ring supported opposite the magnet so that the stator assembly is located between the flux return ring and the magnet. The Office Action takes the position that U.S. Patent No. 5,579,188, incorporated by reference into Dunfield, discloses a coreless stator assembly, and thus the teachings of Dunfield applied to such a motor would meet the requirements of claim 49. This position is traversed. A careful reading of col. 7 line 65 to col. 8 line 6 of Dunfield shows that it is only the phase winding configurations of U.S. Patent No. 5,579,188 that are suggested for use in the motors disclosed in Dunfield. There is no suggestion to encapsulate the coreless stators themselves. Also, the process by which Dunfield encapsulates the

stators would not work on the coreless stators of U.S. Patent No. 5,579,188, because in Dunfield the windings are overmolded after they are wound around the laminations. If there were no laminations, there would not be a rigid structure required in the overmolding process used in Dunfield. In the embodiment of Fig. 13 of the present invention, the baseplate provides relative positioning of the coils in the molding cavity, and allows them to be overmolded without a core.

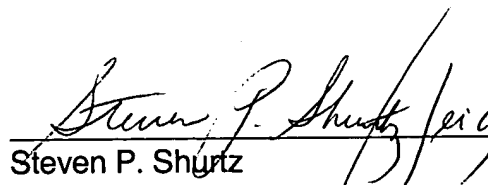
In addition, as noted above, claim 49 requires a flux return ring on a hub opposite a magnet so that the stator assembly is located between a flux return ring and the magnet. The Office Action does not propose how this structure is disclosed in Dunfield. Hence, claim 49, and claims 50 and 51 dependent thereon, are not anticipated by Dunfield.

In the outstanding Office Action claims 1, 9, 10 and 20 were rejected under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,201,321 (Mosciatti). This rejection is respectfully traversed. Mosciatti does not disclose a motor with a thermoplastic material that encapsulates the windings and contacts the baseplate such that the windings, core and baseplate are rigidly fixed together, as required by claims 1 and 10, and claims 9 and 20 dependent thereon. First, Mosciatti uses a curable plastic resin, not a thermoplastic. Second, the spider 37 (core) is not rigidly attached to the front plate 28 (baseplate) as required by claim 1. Third, Mosciatti does not disclose a hub supported on a shaft, the hub having a magnet connected thereto, as required by claims 1 and 10. Thus claims 1, 9, 10 and 20 are not anticipated by Mosciatti.

Claims 6 and 24 were rejected under 35 U.S.C. § 103(a) as unpatentable over Katakura or Dunfield, and claim 22 was rejected as unpatentable over Mosciatti. Each of these rejections were premised on the obviousness of using thermoplastics having certain properties. Regardless of the fact that the present invention did not involve the simple expedient of selecting a well known material to provide recognized desirable properties, as noted above the prior art references do not disclose the structures called for by claims 1 and 10, on which claims 6, 22 and 24 depend. Thus claim 6, 22 and 24 are non-obvious over the cited prior art.

Since each of the rejections have been overcome, the case is in condition for allowance. An early notice to that effect is respectfully requested.

Respectfully submitted,

  
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Dated: April 12, 2002

## APPENDIX A

1. Changes to the paragraphs on page 20, line 16, to page 21, line 11, are as follows:

Most thermoplastic materials have a relatively high CLTE. Some thermoplastic materials may have a CLTE at low temperatures that is similar to the CLTE of metal. However, at higher temperatures the CLTE does not match that of the metal. A preferred thermoplastic material will have a CLTE of less than  $2 \times 10^{-5}$  [in/in/°F] in/in °F, more preferably less than  $1.5 \times 10^{-5}$  [in/in/°F] in/in °F, throughout the expected operating temperature of the motor, and preferably throughout the range of 0-250°F. Most preferably, the CLTE will be between about  $0.8 \times 10^{-5}$  [in/in/°F] in/in °F and about  $1.2 \times 10^{-5}$  [in/in/°F] in/in °F throughout the range of 0-250°F. (When the measured CLTE of a material depends on the direction of measurement, the relevant CLTE for purposes of defining the present invention is the CLTE in the direction in which the CLTE is lowest.)

The CLTE of common solid parts used in a motor are as follows:

	<u>23°C</u>	<u>250°F</u>
Steel	0.5	0.8 (x10 <sup>-5</sup> [in/in/°F] <u>in/in °F</u> )
Aluminum	0.8	1.4
Ceramic	0.3	0.4

Of course, if the motor is designed with two or more different solids, such as steel and aluminum components, the CLTE of the thermoplastic material would preferably be one that was intermediate, the maximum CLTE and the minimum CLTE of the different solids, such as 0.65 [in/in/°F] in/in °F at room temperature and  $1.1 \times 10^{-5}$  [in/in/°F] in/in °F at 250°F.

One preferred thermoplastic material, Konduit OFT-22-11, was made into a thermoplastic body and tested for its coefficient of linear thermal expansion by a standard ASTM test method. It was found to have a CLTE at 23°C of  $1.09 \times 10^{-5}$  [in/in/°F] in/in °F in the X direction and  $1.26 \times 10^{-5}$  [in/in/°F] in/in °F in both the Y and Z directions. (Hence, the relevant CLTE for purposes of defining the invention is  $1.09 \times 10^{-5}$  [in/in/°F] in/in °F.)

Changes to the claims are as follows:

1. (Amended) A spindle motor comprising:
  - a) a baseplate;
  - b) a shaft supported by said baseplate;
  - c) a stator assembly comprising
    - i) a core having poles and
    - ii) windings around said poles;
    - iii) the stator core being rigidly attached to said baseplate;
  - d) injection molded thermoplastic material substantially encapsulating said windings and contacting the baseplate such that the windings, core and baseplate are rigidly fixed together, said thermoplastic having a modulus of elasticity of at least 1,000,000 psi at 25°C; and
  - e) a hub supported on said shaft, said hub having a magnet connected thereto in operable proximity to the stator assembly.
6. (Amended) The spindle motor of claim 1 wherein the thermoplastic used in the encapsulation has a vibratory dampening ratio of at least 0.05 in the range of 0-500 Hz [and a modulus of elasticity of at least 1,000,000 psi at 25°C].
10. (Amended) A spindle motor comprising:
  - a) a baseplate;
  - b) a shaft supported by said baseplate;
  - c) a stator assembly comprising
    - i) a core having poles and
    - ii) windings around said poles,the baseplate and stator assembly not being in direct contact with one another but rather the stator assembly being spaced from the baseplate;
  - d) a hub supported on said shaft, said hub having a magnet connected thereto in operable proximity to the stator assembly; and
  - e) a thermoplastic material secured to the baseplate and substantially encapsulating the stator windings, the thermoplastic material joining the stator assembly to the baseplate in the space between the stator assembly and the baseplate, filling in



the space between them such that the windings, core and baseplate are rigidly fixed together.

21. (Amended) The spindle motor of claim 10 wherein the thermoplastic material has a coefficient of linear thermal expansion of less than  $2 \times 10^{-5}$  [in/in/°F] in/in °F throughout the range of 0-250°F.

24. (Amended) The spindle motor of claim 10 wherein the thermoplastic material has a vibration dampening ratio of at least 0.05 in a frequency range of 0-500 Hz and a modulus of elasticity of at least 1,000,000 psi at 25°C.

59. (New) A spindle motor comprising:

- a) a baseplate;
- b) a shaft supported by said baseplate;
- c) a stator assembly comprising
  - i) a core having poles and
  - ii) windings around said poles,the stator assembly being spaced from the baseplate;
- d) a hub supported on said shaft, said hub having a magnet connected thereto in operable proximity to the stator assembly; and
- e) a thermoplastic material secured to the baseplate and substantially encapsulating the stator windings, the thermoplastic material joining the stator assembly to the baseplate in the space between the stator assembly and the baseplate; wherein the thermoplastic material has a coefficient of linear thermal expansion of less than  $2 \times 10^{-5}$  in/in °F throughout the range of 0-250°F.

60. (New) A spindle motor comprising:

- a) a baseplate;
- b) a shaft supported by said baseplate;
- c) a stator assembly comprising
  - i) a core having poles and
  - ii) windings around said poles,the stator assembly being spaced from the baseplate;

- d) a hub supported on said shaft, said hub having a magnet connected thereto in operable proximity to the stator assembly; and
- e) a thermoplastic material secured to the baseplate and substantially encapsulating the stator windings, the thermoplastic material joining the stator assembly to the baseplate in the space between the stator assembly and the baseplate; wherein the baseplate comprises a stiff thermoplastic material, having a modulus of elasticity of at least 1,000,000 psi at 25°C, and a metal plate substantially encapsulated in the stiff thermoplastic material.

61. (New) The spindle motor of claim 60 wherein the stiff thermoplastic material is the same material as is used to encapsulate the windings.

62. (New) A motor comprising:

- a) a baseplate;
- b) a shaft supported by said baseplate;
- c) a stator assembly comprising
  - i) a core having poles and
  - ii) windings around said poles;
  - iii) the stator core being rigidly attached to said baseplate;
- d) injection molded thermoplastic material substantially encapsulating said windings and contacting the baseplate and core such that the windings, core and baseplate are rigidly fixed together, said thermoplastic having a modulus of elasticity of at least 1,000,000 psi at 25°C; and
- e) a hub supported on said shaft, said hub having a magnet connected thereto in operable proximity to the stator assembly.

63. (New) A motor comprising:

- a) a baseplate;
  - b) a shaft supported by said baseplate;
  - c) a stator assembly comprising
    - i) a core having poles and
    - ii) windings around said poles,
- the stator assembly being spaced from the baseplate;

d) a hub supported on said shaft, said hub having a magnet connected thereto in operable proximity to the stator assembly; and

e) a thermoplastic material secured to the baseplate and substantially encapsulating the stator windings, the thermoplastic material joining the stator assembly to the baseplate in the space between the stator assembly and the baseplate such that the windings, core and baseplate are rigidly fixed together, the stator assembly being connected to the baseplate only through said thermoplastic material.

64. (New) The spindle motor of claim 10 wherein the thermoplastic used in the encapsulation has a vibratory dampening ratio of at least 0.05 in the range of 0-500 Hz.

65. (New) The spindle motor of claim 61 wherein the baseplate and winding encapsulation are formed as one monolithic body.

66. (New) A motor comprising:

a) a baseplate;

b) a shaft supported by said baseplate;

c) a stator assembly comprising

i) a core having poles, and

ii) windings around said poles;

d) a hub supported on said shaft, said hub having a magnet connected thereto in operable proximity to the stator assembly; and

e) an injection molded thermoplastic material encapsulating the windings and also locking the stator assembly to the baseplate, the baseplate and stator assembly not being in direct contact with one another but rather having a space between them filled in by the thermoplastic material.

67. (New) The motor of claim 66 wherein the baseplate is made of a thermoplastic material having a modulus of elasticity of at least 1,000,000 psi at 25°C and a metal plate, the metal plate being substantially encapsulated in the thermoplastic material.

68. (New) The motor of claim 67 wherein the thermoplastic material of which the baseplate is made is the same material that encapsulates the windings, and the baseplate and winding encapsulation are formed as one monolithic body.

69. (New) The motor of claim 63 wherein the thermoplastic material has a thermal conductivity of at least 0.7 watts/meter °K at 23°C.

70. (New) The motor of claim 63 wherein the thermoplastic material has a coefficient of linear thermal expansion of less than  $2 \times 10^{-5}$  in/in °F throughout the range of 0-250°F.

71. (New) The motor of claim 63 wherein the thermoplastic material has a vibration dampening ratio of at least 0.05 in a frequency range of 0-500 Hz.

72. (New) The motor of claim 63 wherein the thermoplastic material has a modulus of elasticity of at least 1,000,000 psi at 25°C.

73. (New) The motor of claim 63 wherein the thermoplastic material has a modulus of elasticity of at least 2,000,000 psi at 25°C.

74. (New) A motor comprising:

- a) a baseplate;
- b) a shaft supported by said baseplate;
- c) a stator assembly comprising
  - i) a core having poles, and
  - ii) windings around said poles;
- d) a hub supported on said shaft, said hub having a magnet connected thereto in operable proximity to the stator assembly; and
- e) an injection molded thermoplastic material encapsulating the windings and also locking the stator assembly to the baseplate, the baseplate and winding encapsulation being formed as one monolithic body.

75. (New) The spindle motor of claim 1 wherein the thermoplastic material has a modulus of elasticity of at least 2,000,000 psi at 25°C.

76. (New) The spindle motor of claim 1 wherein the thermoplastic material has a modulus of elasticity of at least 3,000,000 psi at 25°C.

77. (New) The motor of claim 62 wherein the thermoplastic material has a modulus of elasticity of at least 2,000,000 psi at 25°C.

78. (New) The motor of claim 62 wherein the thermoplastic material has a modulus of elasticity of at least 3,000,000 psi at 25°C.